USDA Natural Resources Conservation Service

Ecological site R035XY124UT
Desert Shallow Clay (Mat Saltbush)

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

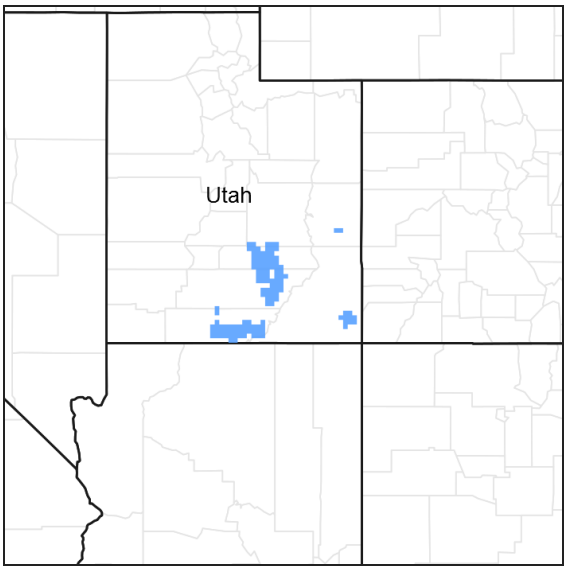


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 035X–Colorado Plateau

This ecological site occurs in the northern portion of MLRA 35, Colorado Plateau Province. It is found principally in the "Canyon Lands" and "High Plateaus of Utah" sections within that MLRA. This geologic area has been stucturally uplifted over time while rivers flowing across it were cutting down into its bedrock. Areas of shale, sandstone, limestone, dolomite, and volcanic rock outcrop are found throughout the region.

Classification relationships

Modal Soil: Clayey, mixed (calcareous), mesic Typic Torriorthents

Associated sites

R035XY103UT	**Desert Clay (Castle Valley Saltbush)**
R035XY118UT	**Desert Sandy Loam (Fourwing Saltbush)**
R035XY122UT	**Desert Shallow Loam (Shadscale)**
R035XY125UT	**Desert Shallow Clay (Shadscale)**
R035XY130UT	**Desert Shallow Sandy Loam (Shadscale)**

R035XY142UT	**Desert Very Shallow Gypsum (Torrey's Jointfir)**
R035XY218UT	**Semidesert Sandy Loam (Blackbrush)**
R035XY221UT	**Semidesert Shallow Loam (Utah Juniper-Pinyon)**
R035XY243UT	**Semidesert Stony Loam (Blackbrush)**
R035XY260UT	**Semidesert Very Steep Stony Loam (Salina Wildrye)**

Similar sites

R034BY117UT	**Desert Shallow Clay (Mat Saltbush)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex corrugata*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Hilaria jamesii*

Physiographic features

This site occurs on hillslopes on mesas and structural benches, knolls and eroding shale hills, pediments, alluvial fans, and lower terraces. Run off is high to very high. Slopes typically range from 2-30% but may occasionally range to 60%. Elevations are generally 3500-6000 ft.

Table 2. Representative physiographic features

Landforms	(1) Mesa (2) Structural bench (3) Pediment
Flooding frequency	None
Elevation	3,500–6,000 ft
Slope	2–30%
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by hot, dry summers, cold winters and moist springs. March, April amd July through October are the wettest months of the year with May, June and November through February being the driest. Approximately 65 to 70% of the precipitation occurs as rain from May through October. Precipitation is extremely variable from month to month and from year to year but averages between 5-10 inches. Mean annual air temperature ranges from 46 to 52 degrees fahrenheit. Large fluctuations in daily temperatures are typical. Much of the summer precipitation occurs as convection thunderstorms. Some years are so dry that little plant growth occurs, and some plants remain dorment.

Table 3. Representative climatic features

Frost-free period (average)	166 days
Freeze-free period (average)	191 days
Precipitation total (average)	10 in

Influencing water features

There are no influencing water features.

Soil features

These soils are typically very shallow to shallow, but occasionally can be moderately deep. The soil surface layer often looks very raw and bare with physical crusts as the dominant feature. The surface color is usually light grayish to reddish brown and surface textures range from silty clays to silty clay loams. The soils are typically found over weathered shale bedrock and have 1-10% gypsum and 35-55% clay. Available water capacity is 1-3.5 inches on shallow soils and 5-7 inches on moderately deep soils. The soil moisture and temperature regimes are typic aridic and mesic respectively.

This site has been used in the following soil surveys and has been correlated to the following components:

UT631 – Henry Mountains Area – Chipeta
UT642 – Kane County Area – Chipeta; Hanksville
UT685 – Capital Reef National Park – Chipeta
UT686 – Escalante Grand Stair Case National Monument – Chipeta; Hanksville
UT687 – Arches National Park – Chipeta
UT689 - Glen Canyon National Recreation Area - Chipeta; Claysprings

Typical Soil Profile:
A-- 0-5 inches; silty clay loam; slightly to moderately alkaline
C -- 5- 17 inches; clay loam; moderately alkaline

Table 4. Representative soil features

Parent material	(1) Residuum–shale
Surface texture	(1) Gravelly silty clay (2) Silty clay (3) Silty clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow
Soil depth	4–20 in
Surface fragment cover <=3"	0–21%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	1.2–2.5 in
Calcium carbonate equivalent (0-40in)	5–30%
Electrical conductivity (0-40in)	2–16 mmhos/cm
Sodium adsorption ratio (0-40in)	5–15
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–6%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This ecological site occurs on shallow to very shallow soils in Major Land Resource Area (MLRA) D35- Colorado Plateau. The general aspect of the site in the reference state is represented by a shrub layer dominated by mat

saltbush with a highly variable herbaceous layer of perennial grasses, principally James galleta and Indian ricegrass.

Large gaps between plants in relic areas indicate that this site did not historically burn often enough for fire to strongly influence the ecological processes of this site. Until further research indicates otherwise, this ecological site description will not include fire as a disturbance in the reference state. Other disturbances such as brush treatments, invasive species, and OHV use, could reduce the resilience of the reference community, creating risk.

This site provides only marginal livestock grazing due to the small amount forage available and the shortage of drinking water. However, the plants present are easily accessible and relatively nutritious. Improper grazing practices can cause any grasses, and perennial forbs present to be grazed out. Improper grazing coupled with drought can also remove the mat saltbush and other shrubs. Once the native community is lost on these soils it is very difficult to get desirable vegetation back.

Halogeton and Russian thistle are most likely to invade this site. At this time, cheatgrass is not readily invading these sites likely due the chemical properties of the soil. Drought, erosion or improper grazing, in combination, can permanently alter the reference plant community.

Other natural disturbance mechanisms include fluctuations in climate, which influence the soil/water/vegetation relationships. These fluctuations can facilitate changes in production from one year to the next.

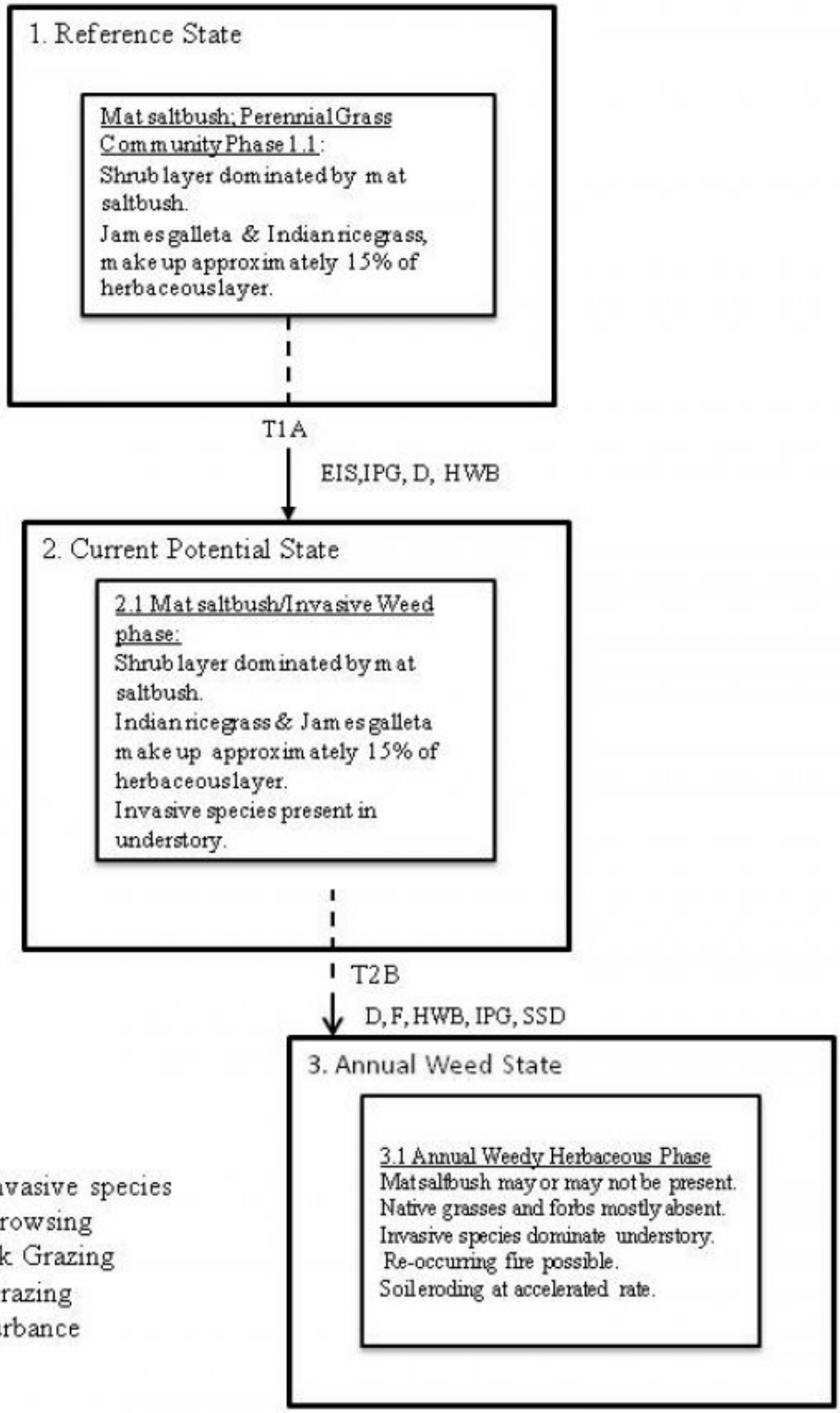
The suitability for rangeland seeding is very poor. The major limiting factors are low precipitation, salinity, sodicty, poor infiltration, shallow soils and low available water capacity.

As vegetative communities respond to changes in management or natural influences, ecological thresholds can be crossed, when this occurs, a return to previous states may not be possible without major energy inputs. The amount of energy needed to affect vegetative shifts depends on present biotic and abiotic features and the desired results.

The following State and Transition diagram shows some of the most commonly occurring plant communities found on this ecological site, does not necessarily depict all the states and communities that are possible. These plant communities are the most prevalent and repeatable. As more data are collected, some of these plant communities may be revised or removed, and new ones may be added. This model was developed using range data collected over the last 30 years in MLRA D35 in southeastern Utah. Both ocular and measured data was collected and utilized.

State and transition model

State and Transition Model
State: Utah
Site Type: Rangeland
MLRA: D-35- Colorado Plateau
R035XY124UT – Desert Shallow Clay (Mat saltbush)



Legend:
D = Drought
F = Fire
EIS = Establishment of invasive species
HWB = Heavy wildlife browsing
IPG = Improper Livestock Grazing
PG = Proper Livestock Grazing
SSD = Soil Surface Disturbance

State 1
Reference State

This reference state describes the natural biotic communities that may become established on the Desert Shallow Clay (mat saltbush) ecological site if all successional sequences are completed under the natural disturbance regime. This state is typically composed of a shrub layer dominated mat saltbush with lesser amounts of perennial warm and cool grasses present. It is normally self sustaining and stable due to its high resistance to natural disturbances and high resilience following natural disturbances. Once invasive plants become established, return to the reference state may not be possible. Reference State: Community phases influenced by native herbivore grazing, insect herbivory, and weather. Indicators: A sparse perennial cool and warm season grass understory with mat saltbush forming the dominant visual aspect. Feedbacks: Extended drought and/or improper grazing that result in a reduction of native perennial plant vigor which may cause invasive species to become established in the understory, increased bare spaces, erosion, and soil loss. Properly managed grazing that maintains the perennial bunchgrass understory. At-risk Community Phase: All communities in this state are at risk when native plants are stressed and/or nutrients become available for invasive plants to establish. Trigger: Introduction and establishment of non-native invasive plants such as cheatgrass and Russian thistle.

Community 1.1
Mat saltbush; Perennial Grass Community Phase

This community is characterized by a mat saltbush shrub canopy with perennial native grasses present in the herbaceous layer. Commonly occurring grasses include Indian ricegrass and James galleta. As grass cover increases, shrub interspaces are reduced. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. Composition by air dry weight is approximately 10 percent forbs, 15 percent grasses, and 75 percent shrubs. Bare ground is variable (40-70%) depending on the number of surface rock fragments which is also variable. Steep hillslopes in this ecological site are often dissected by rills and gullies. The following tables provide an example of the typical vegetative floristics of a community phase 1.1 plant community.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	117	130	147
Grass/Grasslike	6	20	47
Forb	9	18	25
Total	**132**	**168**	**219**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-40%
Grass/grasslike foliar cover	2-5%
Forb foliar cover	1-3%
Non-vascular plants	0%

Biological crusts	0-5%
Litter	0-3%
Surface fragments >0.25" and <=3"	0-6%
Surface fragments >3"	0%
Bedrock	10-40%
Water	0%
Bare ground	40-70%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	1-10%	2-5%	1-3%
>0.5 <= 1	–	5-15%	0-3%	0-2%
>1 <= 2	–	5-10%	0-3%	0-2%
>2 <= 4.5	–	0-5%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

State 2
Current Potential State

The current potential state is similar to the reference state except that invasive species are now present. It is generally dominated by mat saltbush, native perennial grasses and forbs may also be present. Primary disturbance mechanisms include climate fluctuations, native herbivore grazing, domestic livestock grazing, and surface disturbances such as road and pipeline development and off road vehicle (OHV) use. Timing of these disturbances dictates the ecological dynamics that occur. Do to a lack of disturbed locations, the long term effects of such disturbances are not understood. Reference State: Community phases disturbed by climate fluctuations. Indicators: A site dominated by mat saltbush. James galleta, Indian ricegrass and sand dropseed may also be present. Non-native species are now present in the stand. Feedbacks: Extended drought resulting in a reduction of native perennial plant vigor. Normal fluctuations in weather allowing for the maintenance of both shrubs and perennial grasses. At-risk Community Phase: This state is at risk when perennial plant cover is reduced and nutrients become available for invasive plants to flurish. Trigger: Spread of invasive plants to fill available niches.

Community 2.1
Mat saltbush/ Invasive Weed Phase

This community phase is characterized by a mat saltbush shrub canopy, where perennial native grasses are present. Invasive plants are also present. Commonly seen grasses include Indian ricegrass, James galleta, and cheatgrass. Other grasses, shrubs, and forbs may or may not be present and cover is variable. Bare ground, rock fragments, and biological crust cover are very similar to community phase 1.1 in their variability and responses to each other. The following tables provide an example of the typical vegetative floristics of a community phase 2.1 plant community.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	117	130	147
Grass/Grasslike	6	20	47
Forb	9	18	25
Total	**132**	**168**	**219**

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-40%
Grass/grasslike foliar cover	2-5%
Forb foliar cover	1-3%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	0-3%
Surface fragments >0.25" and <=3"	0-6%
Surface fragments >3"	0-6%
Bedrock	10-40%
Water	0%
Bare ground	40-70%

Table 10. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	1-10%	2-5%	1-3%
>0.5 <= 1	–	5-15%	0-3%	0-2%
>1 <= 2	–	5-10%	0-3%	0-2%
>2 <= 4.5	–	0-5%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

State 3
Annual Weed State

The Annual Weed State is generally dominated by invasive annual plants such as cheatgrass, halogeton and Russian thistle. Mat saltbush may or may not be present. Annual Weed State: Community phases maintained, in a self-sustaining manner, by invasive annual weed domination and/or occasional fire. Indicators: A site where ecological processes are driven by cheatgrass and/or other invasive annual forbs. Feedbacks: A self sustaining disturbance regime of invasive annual weed domination and/or occasional fire.

Community 3.1
Annual Weedy Herbaceous Phase

This community phase is characterized by a reduction in mat saltbush and other shrubs, and an increase in invasive annuals. Common invasives include Russian thistle, halogeton, and cheatgrass. This state is the result of disturbances that reduce shrub canopy cover. Bare ground, rock fragments, and biological crust cover are very similar to community phase 1.1 in their variability and responses to each other. The following tables provide an example of the typical vegetative floristics of a community phase 3.1 plant community.

Table 11. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Forb	30	45	65
Shrub/Vine	0	15	25
Grass/Grasslike	0	3	7
Total	**30**	**63**	**97**

Table 12. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0-5%
Grass/grasslike foliar cover	0-3%
Forb foliar cover	3-5%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	0-6%
Surface fragments >0.25" and <=3"	0-6%
Surface fragments >3"	0%

Bedrock	10-40%
Water	0%
Bare ground	40-80%

Table 13. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-5%	0-3%	1-3%
>0.5 <= 1	–	0-5%	0-3%	0-2%
>1 <= 2	–	0-5%	0-3%	0-2%
>2 <= 4.5	–	–	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Transition T1A
State 1 to 2

T1A – This transition is from the reference state where only native perennial warm and cool season grasses occur to a state that also includes invasive species. Events may include combinations of conditions favorable for the establishment of invasive plant species, including improper livestock grazing, heavy wildlife browsing, prolonged drought, and surface disturbances. However, invasive species such as cheatgrass have been known to invade intact perennial plant communities with little to no disturbance. Once invasive species are present in the plant community, a threshold has been crossed.

Transition T2A
State 2 to 3

T2A – This transition is from a state dominated by perennial shrubs, grasses and invasive weeds to a state that is dominated by annual invasive species. Events include brush treatments, improper livestock grazing and/or wildlife browsing coupled with prolonged drought, and surface disturbances that remove shrubs including off-road vehicle use, and road and pipeline development. Once brush is removed and invasive plants dominate, a threshold has been crossed.

Additional community tables

Table 14. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			105–120	
	mat saltbush	ATCO4	*Atriplex corrugata*	105–120	–
3	**Sub-Dominant Shrubs**			53–80	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	18–30	–
	valley saltbush	ATCU	*Atriplex cuneata*	2–12	–
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	0–5	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	0–5	–
	shortspine horsebrush	TESP2	*Tetradymia spinosa*	0–1	–

	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–1	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–1	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–1	–
Grass/Grasslike					
0	**Dominant Grasses**			5–20	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	3–20	–
	James' galleta	PLJA	*Pleuraphis jamesii*	4–20	–
1	**Sub-Dominant Grasses**			14–32	
	Grass, annual	2GA	*Grass, annual*	5–10	–
	Grass, perennial	2GP	*Grass, perennial*	5–10	–
	squirreltail	ELEL5	*Elymus elymoides*	2–6	–
Forb					
2	**Sub-Dominant Grasses**			42–112	
	Forb, annual	2FA	*Forb, annual*	9–20	–
	Forb, perennial	2FP	*Forb, perennial*	9–20	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–7	–
	redroot buckwheat	ERRA3	*Eriogonum racemosum*	2–6	–
	Utah fleabane	ERUT	*Erigeron utahensis*	2–6	–
	common sunflower	HEAN3	*Helianthus annuus*	0–6	–
	purpledisk helianthella	HEMI2	*Helianthella microcephala*	2–6	–
	manybranched ipomopsis	IPPO2	*Ipomopsis polycladon*	2–6	–
	desert biscuitroot	LOFO	*Lomatium foeniculaceum*	0–6	–
	pale evening primrose	OEPA	*Oenothera pallida*	2–6	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	2–6	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	2–6	–
	sego lily	CANU3	*Calochortus nuttallii*	2–6	–
	globemallow	SPHAE	*Sphaeralcea*	1–4	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–3	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–3	–
	onion	ALLIU	*Allium*	0–3	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–3	–
	desert princesplume	STPI	*Stanleya pinnata*	0–2	–
	woodyaster	XYLOR	*Xylorhiza*	0–2	–
	gilia	GILIA	*Gilia*	0–1	–
	buckwheat	ERIOG	*Eriogonum*	0–1	–

Table 15. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrub**			105–120	
	mat saltbush	ATCO4	*Atriplex corrugata*	105–120	–
3	**Sub-dominant Shrub**			12–27	

3	**Sub-dominant Shrub**			12–27	
	valley saltbush	ATCU	*Atriplex cuneata*	2–12	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	0–5	–
	shortspine horsebrush	TESP2	*Tetradymia spinosa*	0–1	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–1	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–1	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–1	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
Grass/Grasslike					
0	**Dominant Grass**			5–40	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	3–20	–
	James' galleta	PLJA	*Pleuraphis jamesii*	4–20	–
	cheatgrass	BRTE	*Bromus tectorum*	1–5	–
1	**Sub-dominant Grass**			1–7	
	squirreltail	ELEL5	*Elymus elymoides*	1–7	–
	Grass, annual	2GA	*Grass, annual*	0–5	–
	Grass, perennial	2GP	*Grass, perennial*	0–5	–
Forb					
2	**Forbs**			9–25	
	Forb, annual	2FA	*Forb, annual*	9–20	–
	Forb, perennial	2FP	*Forb, perennial*	9–20	–
	saltlover	HAGL	*Halogeton glomeratus*	0–10	–
	Russian thistle	SALSO	*Salsola*	0–10	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–7	–
	redroot buckwheat	ERRA3	*Eriogonum racemosum*	2–6	–
	Utah fleabane	ERUT	*Erigeron utahensis*	2–6	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	2–6	–
	pale evening primrose	OEPA	*Oenothera pallida*	2–6	–
	common sunflower	HEAN3	*Helianthus annuus*	0–6	–
	smallhead sneezeweed	HEMI	*Helenium microcephalum*	2–6	–
	manybranched ipomopsis	IPPO2	*Ipomopsis polycladon*	2–6	–
	desert biscuitroot	LOFO	*Lomatium foeniculaceum*	0–6	–
	sego lily	CANU3	*Calochortus nuttallii*	2–6	–
	Pacific aster	SYCH4	*Symphyotrichum chilense*	2–6	–
	globemallow	SPHAE	*Sphaeralcea*	1–4	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–3	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–3	–
	onion	ALLIU	*Allium*	0–3	–
	Leadville milkvetch	ASMO8	*Astragalus molybdenus*	0–3	–
	woodyaster	XYLOR	*Xylorhiza*	0–2	–
	gilia	GILIA	*Gilia*	0–1	–
	buckwheat	ERIOG	*Eriogonum*	0–1	–

Table 16. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrub**			0–20	
	mat saltbush	ATCO4	*Atriplex corrugata*	0–20	–
3	**Sub-dominant Shrubs**			0–5	
	valley saltbush	ATCU	*Atriplex cuneata*	0–5	–
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	0–5	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–5	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	0–5	–
	spiked hoarypea	TESP	*Tephrosia spicata*	0–1	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–1	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–1	–
Grass/Grasslike					
0	**Dominant Grasses**			0–5	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–5	–
	cheatgrass	BRTE	*Bromus tectorum*	0–4	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–3	–
2	**Sub-dominant Grasses**			0–2	
	squirreltail	ELEL5	*Elymus elymoides*	0–2	–
Forb					
0	**Dominant Forbs**			10–60	
	saltlover	HAGL	*Halogeton glomeratus*	5–50	–
	Russian thistle	SALSO	*Salsola*	0–50	–
1	**Sub-dominant Forbs**			20–53	
	spiderflower	CLEOM	*Cleome*	0–20	–
	Forb, annual	2FA	*Forb, annual*	0–10	–
	Forb, perennial	2FP	*Forb, perennial*	0–10	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–4	–
	globemallow	SPHAE	*Sphaeralcea*	1–4	–
	onion	ALLIU	*Allium*	0–3	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–3	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–3	–
	desert princesplume	STPI	*Stanleya pinnata*	0–2	–
	woodyaster	XYLOR	*Xylorhiza*	0–2	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–1	–
	sego lily	CANU3	*Calochortus nuttallii*	0–1	–
	buckwheat	ERIOG	*Eriogonum*	0–1	–
	gilia	GILIA	*Gilia*	0–1	–
	common sunflower	HEAN3	*Helianthus annuus*	0–1	–
	desertparsley	LOMAT	*Lomatium*	0–1	–
	African mustard	MAAF	*Malcolmia africana*	0–1	–

Animal community

--Threatened and Endangered Species--
This section will be populated as more information becomes available.

--Wildlife Interpretation--
Small herds of mule deer and pronghorn antelope may graze/browse on these sites, especially when located near water sources and in the winter. The hot summers and a lack of water often favors small mammals, which may have an easier time finding shelter, food, and water to live. Several species of rats, mice, squirrels, bats, and chipmunks have been observed using this site, along with coyotes and foxes. Lizards can often be observed during the day. Common lizard species include the northern whiptail, desert spiny, and the colorful western collard lizard. (NPS.gov, 2008)

--Grazing Interpretations--
This site has somewhat limited potential for livestock grazing. It is primarily shrubs, with the majority of canopy cover being attributed to mat saltbush. Mat saltbush can serve as forage for livestock, especially as winter range. When present, grasses, primarily Indian ricegrass and James galleta, can provide good forage for horses, cattle, and sheep; however, many times these species are not abundant enough to support livestock. Grazing must be carefully planned and managed to prevent damage to the site. Before making specific grazing management recommendations, an onsite evaluation should be conducted as part of a science based grazing management plan.

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group D due to the shallow depth (NRCS National Engineering Handbook). These soils are saturated quickly due to high infiltration rates and shallow depth; once soils are saturated run off potential is high. Hydrologic groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning watershed-protection and flood-prevention projects and for designing structures for the use, control and disposal of water. Heavy grazing can alter the hydrology by decreasing plant cover and increasing bare ground. Fire can also affect hydrology, but is a rare on this site.(National Range and Pasture Handbook, 2003)

Recreational uses

Recreation activities are hiking and hunting. This site has shape contrasts in aesthetics and landscape.

Wood products

None

Other information

--Poisonous and Toxic Plant Communities--
Russian thistle is an invasive toxic plant, causing nitrate and to a lesser extent oxalate poisoning, which affects all classes of livestock. The buildup of nitrates in these plants is highly dependent upon environmental factors, ie., after rain storms during a drought, on cool/cloudy days, and on soils high in nitrogen and low in sulfur and phosphorus, all which cause increased nitrate accumulation. Nitrate collects in the stems and can persist throughout the growing season. Clinical signs of nitrate poisoning include drowsiness, weakness, muscular tremors, increased heart and respiratory rates, staggering gait, and death. Conversely, oxalate poisoning causes kidney failure; clinical signs include muscle tremors, tetany, weakness, and depression. Poisoning generally occurs when livestock consume and are not accustomed to grazing oxalate-containing plants. Animals with prior exposure to oxalates have increased numbers of oxalate-degrading rumen microflora and thus are able to degrade the toxin before clinical poisoning can occur (Knight and Walter, 2001).

--Invasive Plant Communities--
Generally as ecological conditions deteriorate and native vegetation decreases due to disturbance (fire, improper livestock grazing, drought, off road vehicle overuse, erosion, etc.) invasive species can establish on the site. Of

particular concern in arid environments are the annual invaders including cheatgrass, Russian thistle, kochia, halogeton, common sunflower and mustards. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible.

--Fire Ecology--
The ability for any ecological site to carry fire depends primarily on the present fuel load and plant moisture content. This ecological site, like many desert communities in the Colorado Plateau, likely evolved without the influence of fire. However a year of exceptionally heavy winter rains can generate fuels by producing heavy stands of annual forbs and grasses. If fires do occur, the effect on the plant community may be extreme due to the harsh environment and slow rate of recovery.

Inventory data references

The data collected in 2005-2007 were in conjunction with the soil survey update for Arches and Canyonlands National Park. The vegetation data was collected in associated with a soil pit and geo-referenced. All the data is stored as hard copy files in the NRCS Utah State Office.

Type locality

Location 1: Grand County, UT	
UTM zone	N
UTM northing	4287631
UTM easting	630123
General legal description	Arches National Park

Other references

Knight, A.P. and R.G. Walter. 2001. A guide to plant poisoning of animals in North America. Teton NewMedia. Jackson, WY.

National Engineering Handbook. US Department of Agriculture, Natural Resources Conservation Service. Available: http://www.info.usda.gov/CED/Default.cfm#National%20Engineering%20Handbook. Accessed February 25, 2008.

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NPS.gov. 2008. Canyonlands National Park. Nature and Science. Available: http://www.nps.gov/cany/naturescience/. Accessed on January 4, 2008.

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Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Shane A. Green (NRCS), Robert D. Stager (BLM), Dana Truman (NRCS), Paul Curtis (BLM) and Randy Beckstrand (BLM), V. Keith Wadman (NRCS Ret.).
Contact for lead author	shane.green@ut.usda.gov This ecological site occurs on tropic shale in its early stages of soil formation.
Date	09/11/2008
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Very common. Rills present typically run for most of the slope length. They should be 2-3 inches deep.

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2. **Presence of water flow patterns:** Very common throughout the site. They are expected to be long and connected into drainage networks. Evidence of flow will increase with slope. Flow patterns are sometimes difficult to see due to the rough/cracked surface texture.

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3. **Number and height of erosional pedestals or terracettes:** Plants may show some pedestalling (up to .5 inch), a few exposed roots may be apparrent. Terracettes should be rare and stable, occurring in water flow patterns behind rare debris dams.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 45 – 65%. Ground cover is based on the first raindrop impact, and bare ground is the inverse of ground cover. Ground cover + bare ground = 100%. Poorly developed biological soil crusts that are interpreted as functioning as bare ground (therefore they would be susceptible to raindrop splash erosion) should be recorded as bare ground.

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5. **Number of gullies and erosion associated with gullies:** Present. May be found where adjacent sites or watersheds provide concentrated flows into the site. Gullies may show signs of active erosion. Gullies may show more indication of erosion as slope steepens, or as the site occurs adjacent to sites where runoff accumulation occurs.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** No evidence of wind generated soil movement. Wind caused blowouts and deposition are not expected to be present.

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7. **Amount of litter movement (describe size and distance expected to travel):** Some down slope redistribution of fine litter caused by water. Herbaceous litter typically becomes lodged in cracks in the soil surface. Some fine litter removal by wind, and some fine litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction, especially following large storm events. Litter movement will increase with slope.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 3 under plant canopies and a rating of 2 to 3 in the interspaces using the soil stability kit test. The average should be a 3. Surface texture is silty clay loam. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface horizon is typically 5 inches deep. Structure is typically weak fine subangular blocky. Color is typically light brownish gray (2.5Y6/2). Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Natural erosion would be expected in most storms and spring runoff, with little influence from the scant vegetation cover.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. The higher clay content and platy structure on this site should not be confused with compaction layers.

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Non-sprouting shrubs (Mat Saltbush, Bud sagebrush, Winterfat)

    Sub-dominant: Warm season perennial grasses (Galleta) > perennial and annual native forbs (Desert trumpet) > Cool season grasses (Indian ricegrass) > Biological soil crusts

    Other: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. Siberian Wheatgrass, Forage kochia etc.)
    Biological soil crust is variable in its expression where present on this site and is measured as a component of ground cover.
    Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

    Additional: Factors that contribute to temporal variability include erosion events, insects, and drought. Factors that contribute to spatial variability include slope, aspect, etc.
    Following a recent disturbance such as drought or insects that removes the woody vegetation, native annuals (herbaceous species) may dominate the community. These conditions reflect a community phase within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or**

decadence): During years with average to above average precipitation, there should be very little recent mortality or decadence apparent in either the shrubs or grasses. During severe (multi-year) drought, up to 20% of the plants may die. There may be partial mortality of individual bunchgrasses and other shrubs during less severe drought.

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14. **Average percent litter cover (%) and depth (in):** Litter cover (including under plants) nearly all of which should be fine litter. Depth should be 1 leaf thickness in the interspaces and under canopies.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 175-200 #/acre on an average year.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Russian thistle, halogeton, annual mustards, common sunflower.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years.
